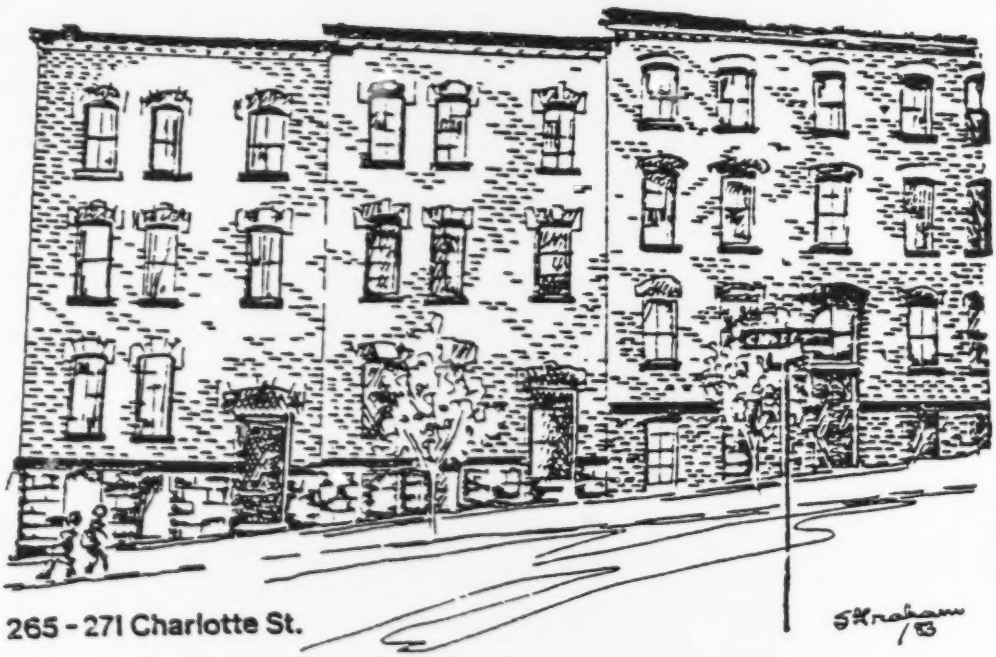
Final Report

A project under the Canada
New Brunswick Conservation
and Renewable Energy
Demonstration Program

CO-OP Housing Retrofit
South City Housing Co-operative
Saint John
CREDA Project #2051



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Canada/New Brunswick Conservation and Renewable Energy Demonstration Program

The Conservation and Renewable Energy Demonstration Program Program is administered in New Brunswick by the Energy Secretariat and managed jointly with Energy, Mines and Resources Canada. The Program is designed to help demonstrate promising conservation and renewable energy technologies, to develop public awareness and understanding of these technologies, and to create employment in new or existing industries.

Through over 100 demonstration projects in New Brunswick, a wide variety of conservation and renewable energy technologies have proven to be technically sound and economically attractive. These demonstration projects should now provide a catalyst for commercialization and lead to widespread adoption of many of these proven technologies.

This final report is based on a project which was financially supported by the Energy Demonstration Program. For further information on other demonstration projects funded in New Brunswick under this program, contact:

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Programme Canada/Nouveau-Brunswick de démonstration des économies d'énergie et des énergies renouvelables

Le Programme de démonstration des économies d'énergie et des énergies renouvelables est administré au Nouveau-Brunswick par le Secrétariat à l'énergie, en collaboration avec Energie, Mines et Ressources Canada. Ce programme tente d'abord de vérifier la fiabilité des techniques de conservation d'énergie, d'accroître la sensibilité du public envers ces techniques et, enfin, de favoriser la création d'emplois au sein des industries nouvelles ou déjà existantes.

Un grand nombre de projets de démonstration se sont avérés à la fois techniquement réalisables et économiquement attrayants.

Le succès ainsi rencontré encourage la commercialisation des procédés les plus accessibles. Cela entraînerait certes l'adoption d'un grand nombre de ces techniques par les propriétaires de domiciles et par l'industrie privée.

Ce rapport final est basé sur un projet qui a reçu une aide financière du Programme de démonstration. Pour de plus amples renseignements, communiquez avec la:

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D I S C L A I M E R

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D E N I D E R E S P O N S A B I L I T E

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CO-OP HOUSING RETROFIT
SOUTH CITY HOUSING CO-OPERATIVE

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1.0 EXECUTIVE SUMMARY

This multi-unit residential rehabilitation project consists of 17 co-op housing units with some ancillary spaces, i.e. laundry facilities, storage, etc. The 18,000 sq. ft., 100 year old masonry building was completely renovated using specific conservation techniques. As follows in the description of demonstration section, various items were undertaken in an attempt to reduce domestic energy consumption.

The project propcsed demonstrated the viability of rehabilitating older City buildings for housing projects when due consideration was given to energy efficiency and conservation during renovation. The results of this project should also demonstrate to owners of similar projects, and to the general public, methods of reducing domestic energy consumption through feasible retrofits.

For one year the project was monitored, along with six other rehabilitated residential buildings, and the information collected was compared on a cost per degree day per square foot basis.

The success of this demonstration project lies in the interpretation of the following:

(a) Hands-on experience with respect to conservation related materials, equipment and rehabilitation techniques.
(b) Accurate monitoring of the demonstration project and its comparison to similar projects.

1.0 SOMMAIRE RECOMMANDATION

Ce projet de réfection d'un immeuble à appartements avait trait à une coopérative d'habitation comprenant 17 logements ainsi que des locaux auxiliaires, soit une salle de lavage, une aire d'entreposage, etc. Le bâtiment, âgé de 100 ans et mesurant 18 000 pieds carrés, a été complètement rénové par l'application de techniques particulières d'économie de l'énergie. Comme on l'indique dans la description de ce projet de démonstration, divers travaux ont été réalisés en vue de réduire la consommation d'énergie domestique.

Le projet en question a démontré la viabilité de la rénovation d'anciens édifices municipaux en projets d'habitation dans la perspective de l'économie de l'énergie et d'une plus grande efficacité énergétique. Les résultats du projet devraient également servir à démontrer aux propriétaires réalisant des projets semblables et au public en général diverses méthodes de réduction de la consommation d'énergie domestique par l'application de techniques de rénovation faisables.

Le projet a été l'objet d'un contrôle d'un an, en même temps que six autres projets semblables, et l'information recueillie a été comparée sur une base de coût par degré-jour par pied carré.

Le succès de ce projet de démonstration repose sur l'interprétation des éléments suivants:

a) Expérience pratique en ce qui a trait aux économies d'énergie reliées aux matériaux, au matériel et aux techniques de réfection.

b) Contrôle précis du projet de démonstration et sa comparaison à des projets semblables.

2.0 INTRODUCTION AND BACKGROUND

The project involved renovating an aging building into seventeen (17) co-op housing units in an older Saint John, NB neighbourhood. The 100 year-old masonry building was comprehensively renovated using various energy conservation techniques. The unit size ranges from one to three bedrooms and from 460 sq. ft. to 1140 sq. ft.

The demonstration project is owned and operated by South City Housing Co-op Ltd., incorporated as a non-profit housing co-operative in December, 1981. Project development was by Housing Alternatives Inc.; the architects were Mott, Myles & Chatwin, and the contractor was Blanchard Homes (1983) Ltd. of Rothesay, NB. Renovation began in December, 1982 and the building was substantially complete by July, 1983.

The principle objective of this retrofit was to demonstrate to builders, homeowners and co-op members the feasibility and potential of applying and comparing similar energy-effective measures to their rehabilitation/ retrofit projects. By comparing the demonstration data to other projects, each with differing physical properties and using differing conservation techniques, alternative technologies can be evaluated in relation to each other.

Energy consumption in the building was to be considerably reduced, resulting in annual savings of $16,558, with a simple payback of 7.0 years.

However, using heat loss estimates for the pre-existing building envelope, calculated by Enerplan Consultants Ltd., the annual energy savings appear

to be even greater than anticipated.

Today's economic conditions and high energy costs have created the need for reduced energy consumption in virtually every aspect of building and housing. With a new awareness of the viability of rehabilitating older buildings, numerous projects could benefit from results of this retrofit. To familiarize builders, homeowners and co-op members with the conservation techniques demonstrated by this project, and to enable the above to effectively compare their energy consumption figures with other similar projects, the information gathered through this demonstration project will be shared among various groups and individuals directly and indirectly involved in developing or operating rehabilitated buildings.

3.0 GENERAL DESCRIPTION OF DEMONSTRATION

This project involved the complete renovation of a 100 year-old building in Saint John to develop a co-operative housing complex including seventeen family apartment units. Floor area in use is approximately 18,000 square feet. It was estimated that heat loss through the existing building envelope was 48 kWh/ft.^{2}/yr.

We proposed to demonstrate the viability of older City buildings for housing projects when due consideration is given to energy efficiency and conservation during renovation. The results of this project will also demonstrate to owners of similar type buildings and to the general public methods of reducing domestic energy consumption through feasible retrofits.

The following major items were undertaken:

(1) Improvement to the building envelope - that is, exterior walls, windows, doors, roof and basement floor.
(2) Provision of an efficient, controllable heating and lighting system.
(3) Monitoring and processing data comparing this and six other rehabilitation projects.

3.1 Building Envelope

(a) The existing roof structure was built-up roofing with an R value of about 3. Blown-in insulation was used to increase this R

value to RSI 4.9 (R 28).

(b) The existing double hung windows were removed and replaced with wood framed double glazed (See Window Detail) windows with operable awning sections.

(c) Existing entrance doors were replaced, weatherstripped and storm doors installed.

(d) The existing wooden ground floor was replaced with granular fill and concrete slab over two inches of styrofoam SM.

(e) Outside walls were insulated increasing R value from 3 to 23, by the addition of a new interior wall (See Wall Section).

(f) Existing chimney flues were removed and sealed.

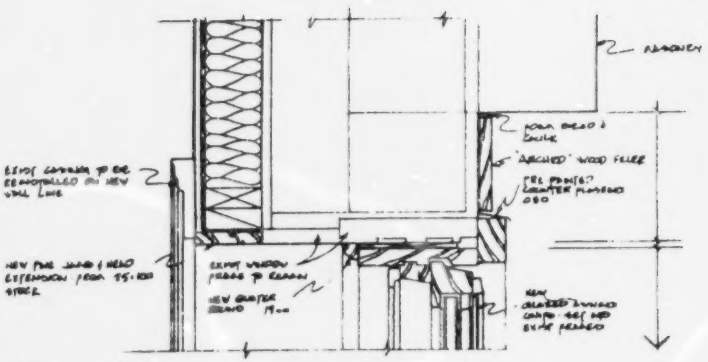
3.2 Services

(a) Space heating is provided by electric baseboard with individual room thermostats.

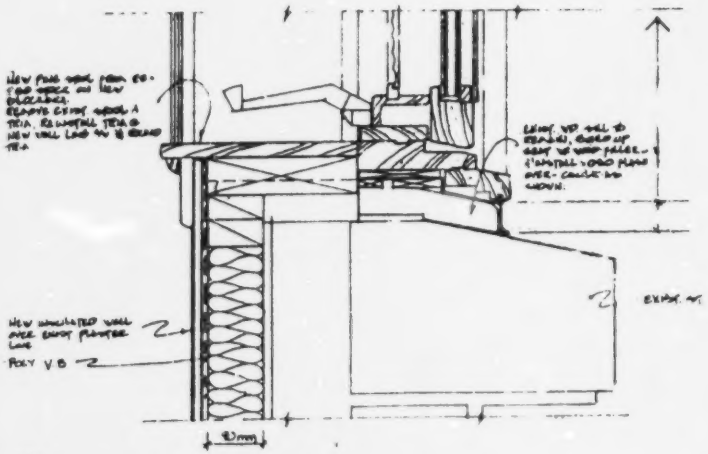
(b) Domestic hot water is provided by 20 gal. domestic, electric hot water heating units for each one and two bedroom apartment. 40 gal. domestic, electric hot water heating units were installed in the three bedroom units. Instantaneous water heaters, ISE ultra warm model W-4, were installed in 4 kitchen sinks only.

(c) Fluorescent lighting was installed in all public areas including stairs, corridors and laundry room.

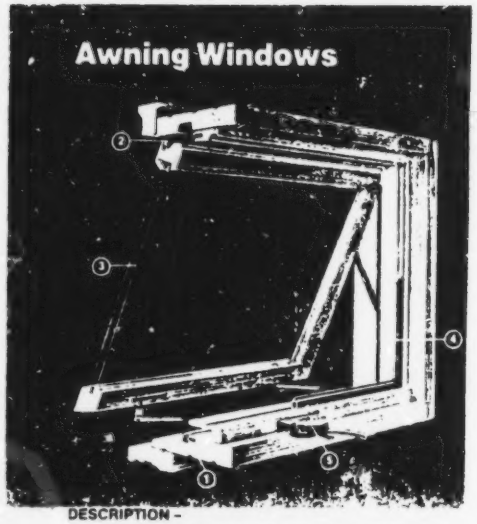
(d) Cold water only was supplied to the laundry area.



3 HEAD DETAIL - 1ST, 2ND & 5TH FLOORS / 4TH FL. EXIST. FRAMES TO BE REMOVED & NEW PROVIDED
SCALE: N.T.S



4 SILL DETAIL - 1ST, 2ND & 4TH FLOORS
SCALE: N.T.S



DESCRIPTION -

The Schurman Awning Window is a lever operated top-hinged unit consisting of wood frame, wood sash complete with primary and secondary weatherstripping and full screen and hardware. Available natural finish or factory finished white with permashield*.

SPECIFICATION -

Frame - shall be toxic water repellant preservative treated sound kiln dried pine, selected to provide a high quality surface suitable for exterior paint or stain. Frame shall be assembled complete with poly vinyl butyl weatherstripping. Frame shall have exterior wood casing complete with sub sill. Frame shall have polymer weatherstripping fitted to both side jambs.

Sash - shall be toxic water repellant preservative treated sound kiln dried clear pine, selected to provide a high quality surface suitable for stain or paint. Sash corners shall be of mortise and tenon construction.

Glazing - shall be insulating thermal glass with ½" (10mm) air space. Glass shall meet CAN 2-12.8M76 standard. Glass shall be bedded and back bedded in sash with acrylic latex glazing sealant and secured with pine stops.

Hardware - shall consist of steel zinc plated hinges with chromate coating, friction adjusting. Sash operator shall be high pressure zinc die cast case and lever handle with steel arms, chromate coated. Finish shall be coppertone. Screen shall be of aluminum frame, baked enamel finish with black fiberglass screen cloth, removable from interior.

Grilles - (OPTIONAL) - shall be available in attractive colonial style with attaching hardware removable from interior for easy cleaning.

Illustrated above are features which yield maximum user comfort and convenience.

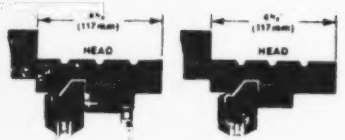
1. **Primary Weatherstripping** - of flexible P.V.C. bulb design is compressed tightly between sash and frame around entire perimeter of window. Air infiltration - and the cost of heating and cooling - is effectively reduced.
2. **Secondary Weatherstripping** - of P.V.C. sliding type design is secured to top and bottom sash rails and side jambs providing additional weather protection.
3. **Glazing** - factory sealed insulating glass with ½" (10mm) air space - insures lower heat loss.
4. **Screen** - is removable from interior and finished in matching bronze enamel colour.
5. **Lever Operator** - provides easy window operation allowing unit to remain open at any angle. Lever folds and locks conveniently out of the way when closed.

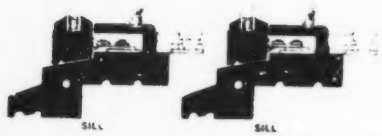
*Schurman Awning units are manufactured to C.S.A. Specification Number [illegible] and have passed A.S.T.M. E331 Water Resistance Test and A.S.T.M. E283 Air Infiltration Test.

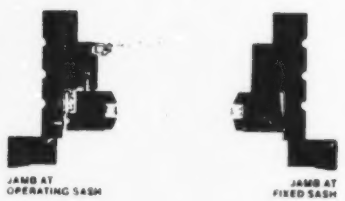
SCHURMAN

8wow
SL

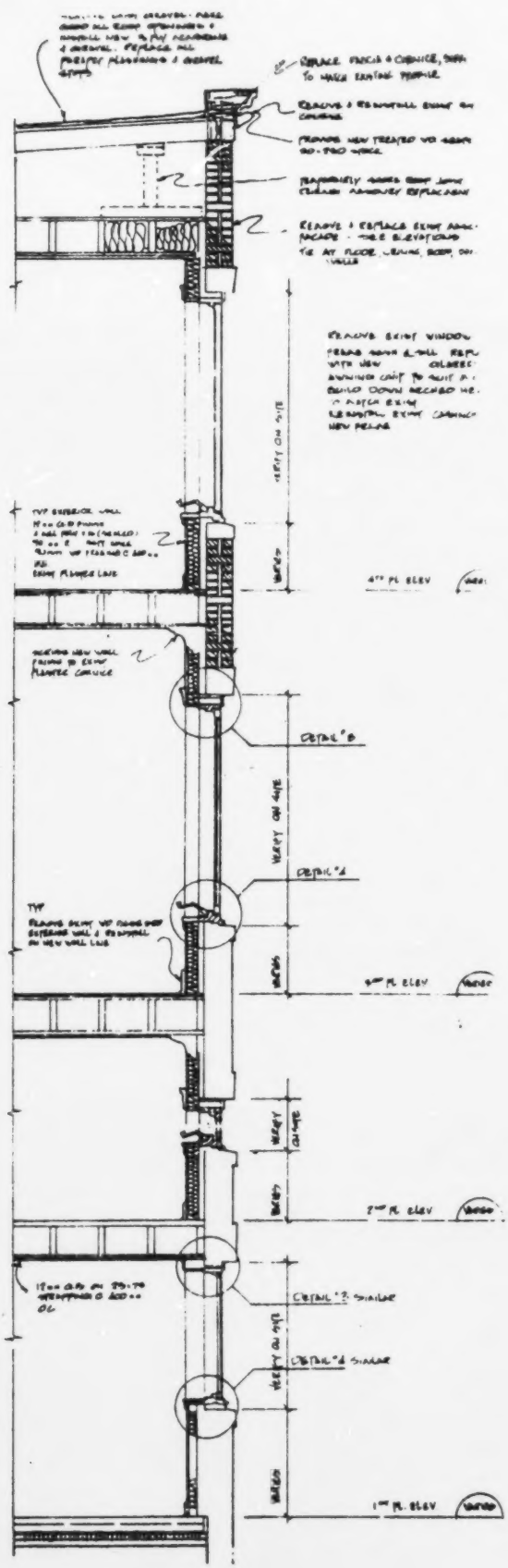
Details: ¼ full size







TYPICAL WINDOW DETAILS


REMOVE FASCIA & CORNICE, SHIM TO MATCH EXISTING PROFILE
REMOVE & RE-INSTALL EXIST GUTTER ON CORNICE
REMOVE NEW TREATED WD BLOCK AND WOOD WEDGE
TEMPORARILY SHORE EXIST LINTEL DURING REMOVAL/REPLACEMENT
REMOVE & REPLACE EXIST MASONRY - SEE ELEVATIONS TIE AT FLOOR, CEILING, ROOF, ON WALLS
REMOVE EXIST WINDOW FRAME, SASH & SILL. REPLACE WITH NEW ALUMINUM CLAD WINDOW UNIT TO MATCH EXIST. BUILD DOWN RECESS TO MATCH EXIST. RE-INSTALL EXIST CASING & NEW MOLDING
TYP EXTERIOR WALL
NEW GLASS PANELS
NEW FRAME TO MATCH EXIST
NEW SILL
REMOVE WD FRAME & SASH
RE-INSTALL EXIST CASING
NEW MOLDING
EXIST PLASTER LATH
MATCH NEW WALL FINISH TO EXIST PLASTER CORNICE
DETAIL "B"
DETAIL "A"
TYP
REMOVE EXIST WD FRAME AND EXTERIOR WALL & RE-INSTALL ON NEW WALL LATH
NEW GLASS ON EXIST SASH & ADD NEW GLAZING BEAD
DETAIL "3" SIMILAR
DETAIL "4" SIMILAR
4TH FL ELEV
3RD FL ELEV
2ND FL ELEV
1ST FL ELEV

TYPICAL WALL SECTION

4.0 INSTALLATION AND MONITORING OBSERVATIONS

4.1 Installation, Building Envelope

In our example, an insulated stud wall was constructed over the inside surface of the existing exterior walls. This was necessary to enable the R 20 increase in the existing wall assembly. The existing wall had little or no cavity (typical in most older masonry buildings). Apart from a substantial increase in cost, the double wall presented problems regarding tying it into existing trim and ornamental plaster detailing. Also, the increase in dead load, realized by the addition of the double wall, could potentially create differential settlement problems in an aging, complex structural system. Tighter on-site supervision could improve the effectiveness of many conservation items such as insulation or vapour barriers. The energy consumptions for the lowest level units were considerably less than what we normally encounter, partially due to the removal of the existing wooded floors and their replacement with granular fill and a concrete slab over two inches of styrofoam SM. However, the benefit of two inches of styrofoam under the entire slab, as opposed to insulating just the slab perimeter itself, is debatable. Some moisture problems were noted in these lower units and may be connected with the new slabs themselves. Data collected indicated the problem may be more closely related to the user's household size and habits.

As expected, the new wood frame, double glazed windows performed well. However, in the handicapped units, the increased wall thickness, resulting from the new inside wall, made some windows inoperable by handicapped people.

4.2 Installation, Services and Equipment

Domestic hot water is provided by 20 gal. electric heater units, purchased by South City Housing Co-op, one per unit. The smaller sized water heaters, while more efficient to operate, must be purchased and maintained, by their owners as the local utilities refuse to rent a lower capacity heater. This tends to encourage the rental, from the utilities, of oversized energy-wasteful 40 gal. hot water heaters.

Instantaneous, ultra-warm heaters were installed on a demonstration basis in 4 kitchens. Hot water plumbing connections were roughed-in during the renovation stage, enabling the kitchens to be connected to the 20 gal. heaters if the instantaneous heaters were removed.

While the ultra-warm, instantaneous heaters did deliver some warm water, the volume was reduced to such a degree that they proved unacceptable to their users. All 4 instantaneous heaters were removed.

Cold water only was supplied to the building's laundry room. This has resulted in significant energy savings for the Co-op, without serious objections from the users.

While the flourescent lighting installed in the public areas is unquestionably

more energy efficient than incandescent, its real value lies in the fact that its lamps last much longer, requiring less frequent replacement in usually very inaccessible locations.

Space heating was provided by electric resistance baseboard heaters with individual line voltage room thermostats. While this system can be cost effective, its success is totally dependant on the user's understanding of how to operate it efficiently. Household size, lifestyles and attitudes toward comfort all influence its operational success.

4.3 Monitoring Observations

Monitoring this and six other similar buildings, for approximately one year, required written permission from 36 different households (without it the local utility would not release the required consumption data).

Monitoring of the domestic hot water consumption proved too difficult to continue, as access to the meters required prior permission from the tenants. This was not always possible with respect to the timing of other data collections.

To compare the results of monitoring seven different buildings, each with individual specifics, all data was reduced to costs per degree day per square foot ($/SF/DD).

When comparing or analyzing any data relating to the above the particular construction type, exposure to climate, degree of renovation and user habits, etc. must be considered.

5.0 COST BENEFIT ANALYSIS

5.1 Cost Summary

A cost summary of material/labour and monitoring, relating to items covered by this demonstration project, is as listed:

	EXPENDITURES	
BUDGETED ITEMS	GROSS	CREDA
Roof and Ceiling Insulation	5388	3447
Windows	35500	27134
Doors	9400	7393
Concrete Slabs	17889	9975
Wall Insulation	34157	26862
Chimney Roof	9575	7530
DHW	9306	6771
Lighting	3485	2740
Additional*	----	4702.60*
Monthly Monitoring	6000	6000
Monitoring Equipment	3500	4345.40
Progress Reporting	5000	5000
Engineering and Mgt.	10000	10000
Information Transfer	3500	3500
Final Report	5000	5000

Gross Total Cost	163248
SCHC Cost	32848
NET GRANT	130400

*In view of the energy consumptions monitored, additional energy conservation measures, i.e. air sealing, will be required in some units.

5.2 Economic Analysis

Project Costs:

Energy Retrofit Costs	$129,402.60
Monitoring & Technology Transfer	33,845.40
TOTAL ENERGY PROJECT COSTS	163,248.00

Operating Energy Costs:

Pre-Retrofit Estimate -

Pre-Retrofit Annual Fuel Cost - Unavailable, Building Vacant.

Exterior Heat Loss 48 Kwh/SF/YR or

48 x 18,000 x $.07 =	60,480.00

Post-Retrofit Annual Energy Cost -

Estimated Heat Loss 34.9 Kwh/SF/YR or

34.9 x 18,000 x $.07 =	43,922.00
NET ANNUAL SAVINGS:	16,558.00
Simple Payback Period	9.8 years

Post-Retrofit Estimate -

Pre-Retrofit Annual Fuel Cost - Unavailable, Building Vacant.

Exterior Heat Loss 48 Kwh/SF/YR of

48 x 18,000 x $.07 =	60,480.00

Post-Retrofit Annual Energy Cost -

Actual Energy Cost (incl. lighting & DHW)	12,000.00
NET ANNUAL SAVINGS:	48,480.00
Simple Payback Period	3.4 years

Examining the above two sets of calculations, it at first appears the retrofit has reduced the payback period from what was originally estimated at 9.8 years to 3.4 years. However, due to the inevitable inaccuracy of the pre-retrofit estimate, the above comparison is surely not the clearest method of evaluating the retrofit's performance (the building was vacant before renovations).

To achieve a more accurate evaluation of the project's performance, a comparison of it with other similar retrofits is warranted. Refer to graphs in appendices.

BUILDING	BUILDING TYPE*	ANNUAL COST PER 1000 SF
93 Victoria St.	3 story wood frame, no retrofit	$1,609.98
99 Douglas Ave.	3 story wood frame, no retrofit	1,507.01
244 Germain St.	3 story masonry, no retrofit	1,320.00
High Meadow Park	town house, wood frame, insulated and air-sealed	822
265-271 Charlotte St.	3 story masonry, demonstration project	822
91 City Line	2 story, wood frame, retrofit	776.30
101 Victoria Street	3 story, wood frame, retrofit	685.00

*Refer to Building Descriptions in Appendices.

Therefore, using the above, the pre-retrofit energy cost would compare as follows:

Pre-Retrofit Energy Costs, Total	$26,300 (using average of above)
Post-Retrofit Energy Costs, Total	12,000 (actual comsumption 1983-1984)
	14,300
Simple Payback Period	11.4 years

Adjusting for retrofit capital costs only, the simple payback period would reduce to 9.1 years.

The difficulty in determining the pre-retrofit energy costs made it impossible to establish an accurate payback period. However, it lies within 3.4 and 9.1 years, a range that indicates the extra costs associated with the retrofit were justified.

7.0 CONCLUSIONS

The cost/benefit analysis indicates the difficulty in establishing an accurate payback period (i.e. economic success). Examining the comparisons established in the relative energy consumption calculations, and considering the building's age and construction type, the demonstration project performed well, economically. It matched a relatively new construction project (1970) which was insulated and air sealed. At first glance, it appears to indicate great success for the demonstration project. However, examining it in relation to comparable projects with less costly retrofits, the costs associated with some aspects of the demonstration project are somewhat difficult to justify. (Refer to Sections 4.0, 8.1 and 8.2). To further improve the project's performance, extra work (air sealing) is suggested in the units with particularly poor energy consumption figures.

By monitoring total energy consumption in 39 units, in seven buildings, each with it's own building specifics, we have evolved invaluable data with which we can use to compare and evaluate existing and future retrofitting techniques. The demonstration project provides us with a control base or datum that new information can be evaluated against.

As the rehabilitation market continues to strengthen, energy retrofit will increasingly form a major role in any rehab scheme. Evaluating and fine tuning conservation and energy retrofit techniques, and comparing the performance results with other known project examples, enables one, through first hand experience and comparative monitoring, to achieve invaluable insight into the continual development of rehabilitative

energy conservation technology. With this in mind, the success and impact of the demonstration project is obvious.

8.0 RECOMMENDATIONS

Installations

Walls - The extra costs associated with the addition of new, insulated interior stud walls are easier to justify in buildings where no wall cavity exists.

- Constructing a new furred out wall, directly over an existing wall, insulated with rigid insulation and effectively air-sealed, would probably compare favourably with the above.

Windows - The awning type, wood frame, double glazed windows performed satisfactorily. However, in some situations, repairing the existing frames and sashes, then installing a new sealed metal storm, has proven to be an economically successful solution.

Insulation - Only marginal savings were indicated by the addition of complete under-slab insulation. Perimeter insulation would probably perform acceptably well.

- Tighter, on-site supervision during installation would ensure superior, quality control.

- Closer attention to air-sealing is most desirable, especially in older buildings being converted to electric baseboard heat.

Services

Cold Water Laundry - As the users became familiarized with cold water washing, initial opposition disappeared. This service has resulted in

substantial savings for the Co-op.

Instantaneous Water Heaters - The restricted warm water flow was found unacceptable to the users. Instantaneous hot waterheaters could prove much more acceptable.

- Pre-installation of hot water lines to allow for subsequent connection to conventional domestic hot water heaters allowed the instantaneous water heaters to be removed without substantial cost.

20 gal. DHW Heaters - The local utility does not rent 20 gal. DHWH. Therefore, most users are encouraged to rent 40 gal. DHWH. 20 gallons of hot water was found to be sufficient for all units monitored, excluding the 3 bedroom units. Smaller capacity water heaters should be available on a rental basis.

Electric Baseboard Heat - Examining the monitoring results (refer 8.1 and 8.3) indicate the buildings retrofitted with electric baseboard heat were substantially more efficient to operate, in terms of economics, comfort and system control. However, most users tend to be initially unfamiliar with both the costs and operation of this type of heating system. Some prior education or familiarization is desirable.

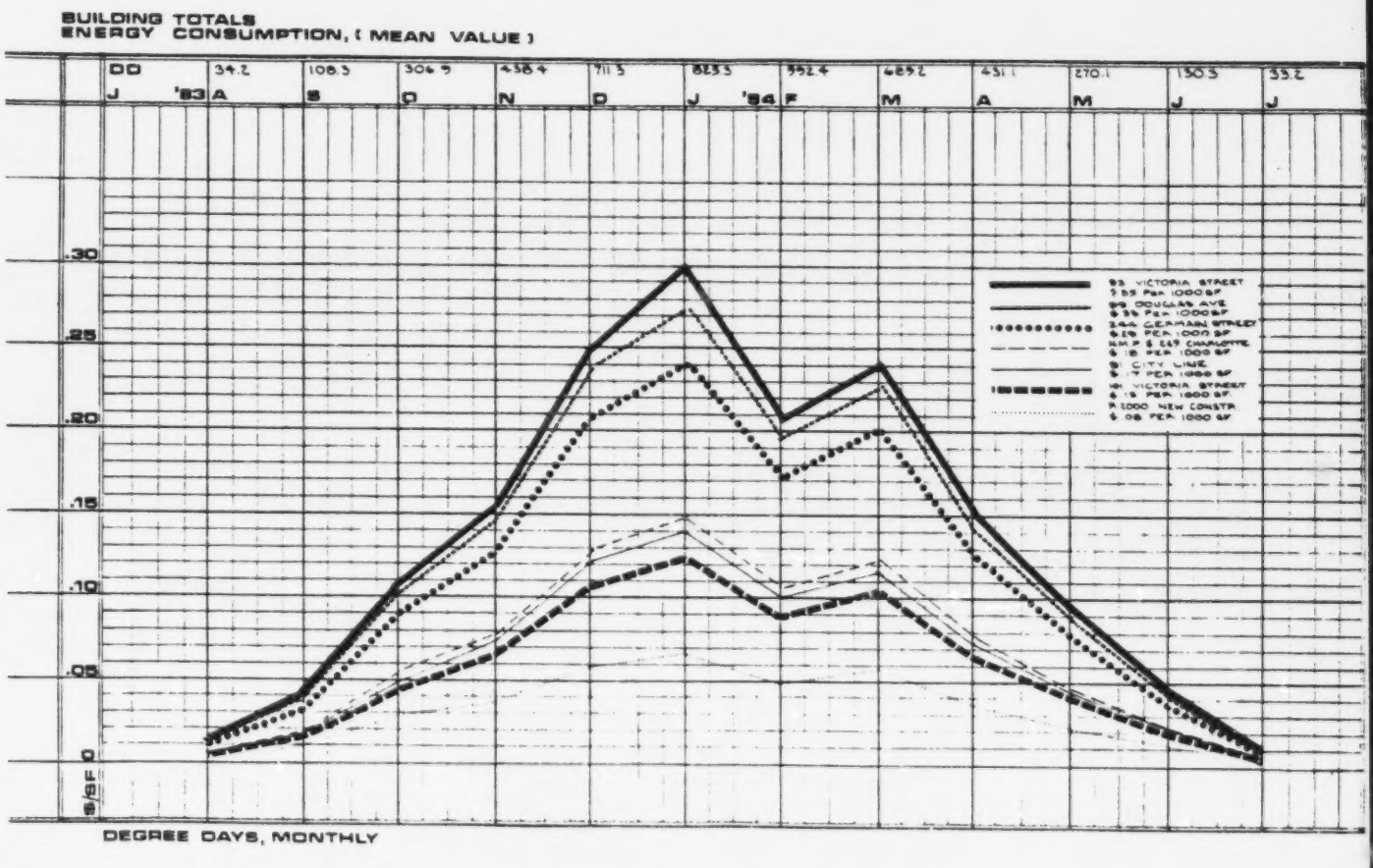
Observations made from monitoring the demonstration project's energy data, indicate some units have performed poorly with respect to energy consumption. We suggest additional energy conservation measures be undertaken in these units (i.e. air-sealing).

By incorporating the energy grant into the preliminary stage of a retrofit

project, it would ensure effective, initial design planning, resulting in maximum returns from the retrofit plan.

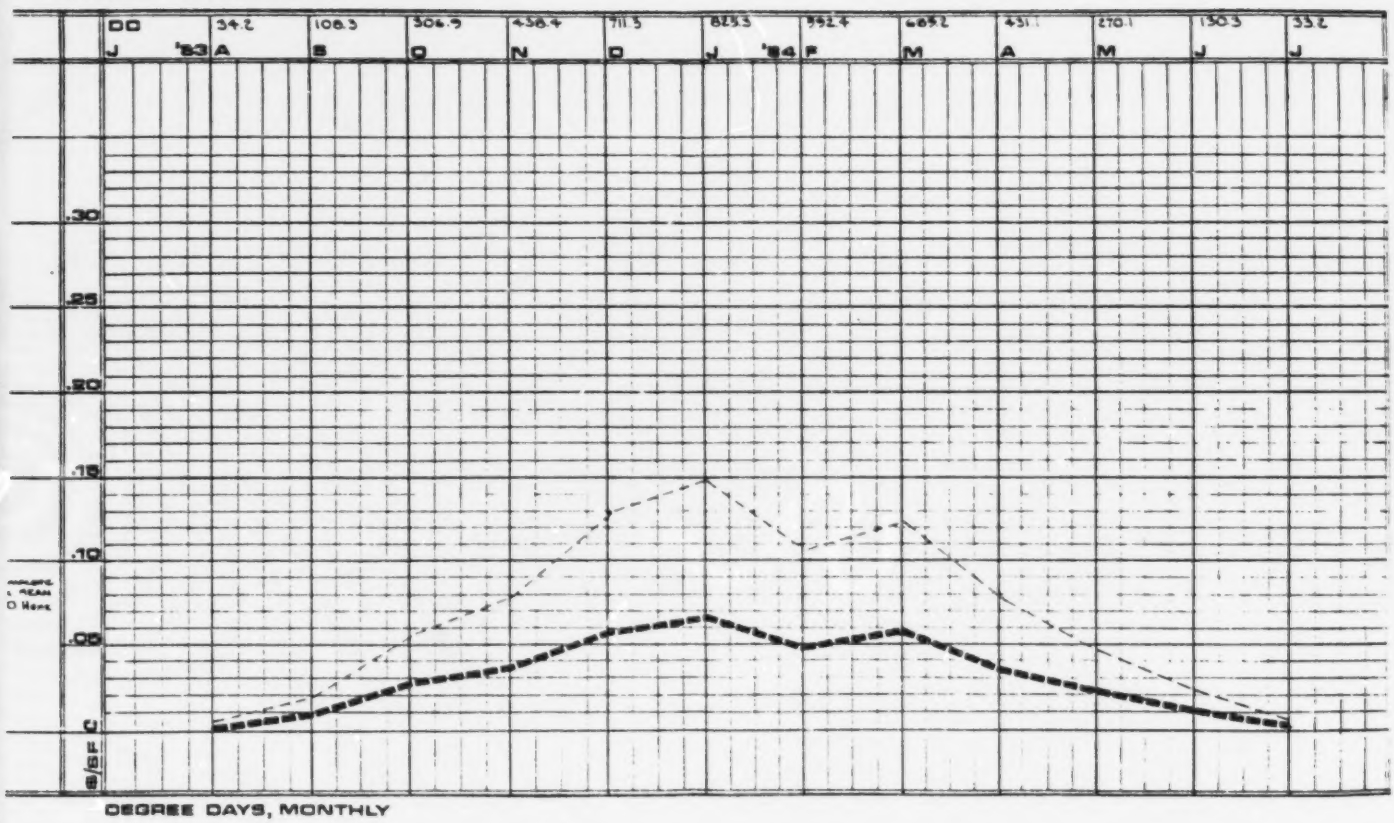
The purpose of this project was to demonstrate the viability of retrofitting older City buildings for housing projects with energy efficiency and conservation seriously considered during renovation. Results of this project also demonstrate to owners of similar type buildings, to Co-ops and to the general public, methods of reducing domestic energy consumption through feasible retrofitting techniques.

8.1 Consumption Graphs



285-271 CHARLOTTE & A 1000 HOME

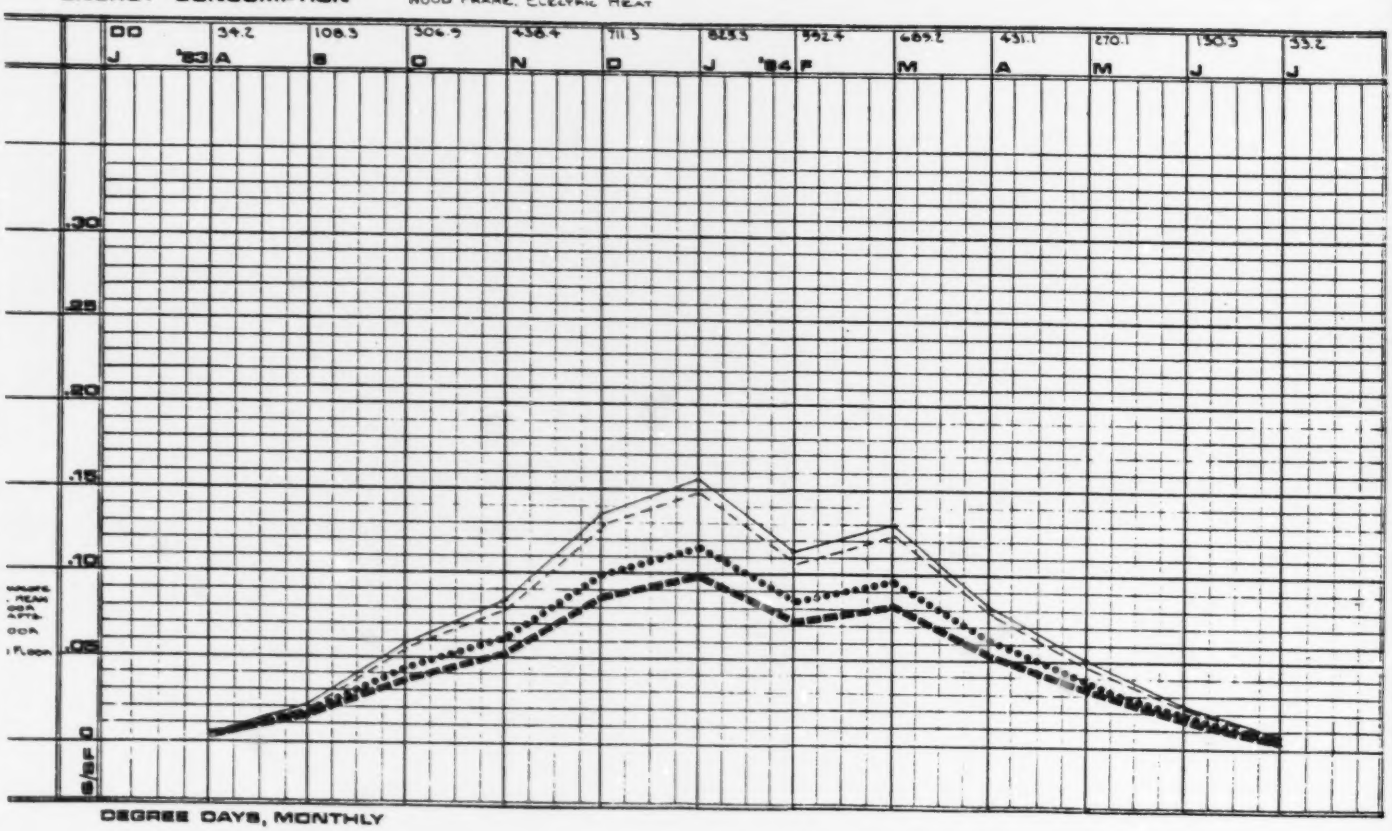
ENERGY CONSUMPTION



DEGREE DAYS, MONTHLY

ENERGY CONSUMPTION

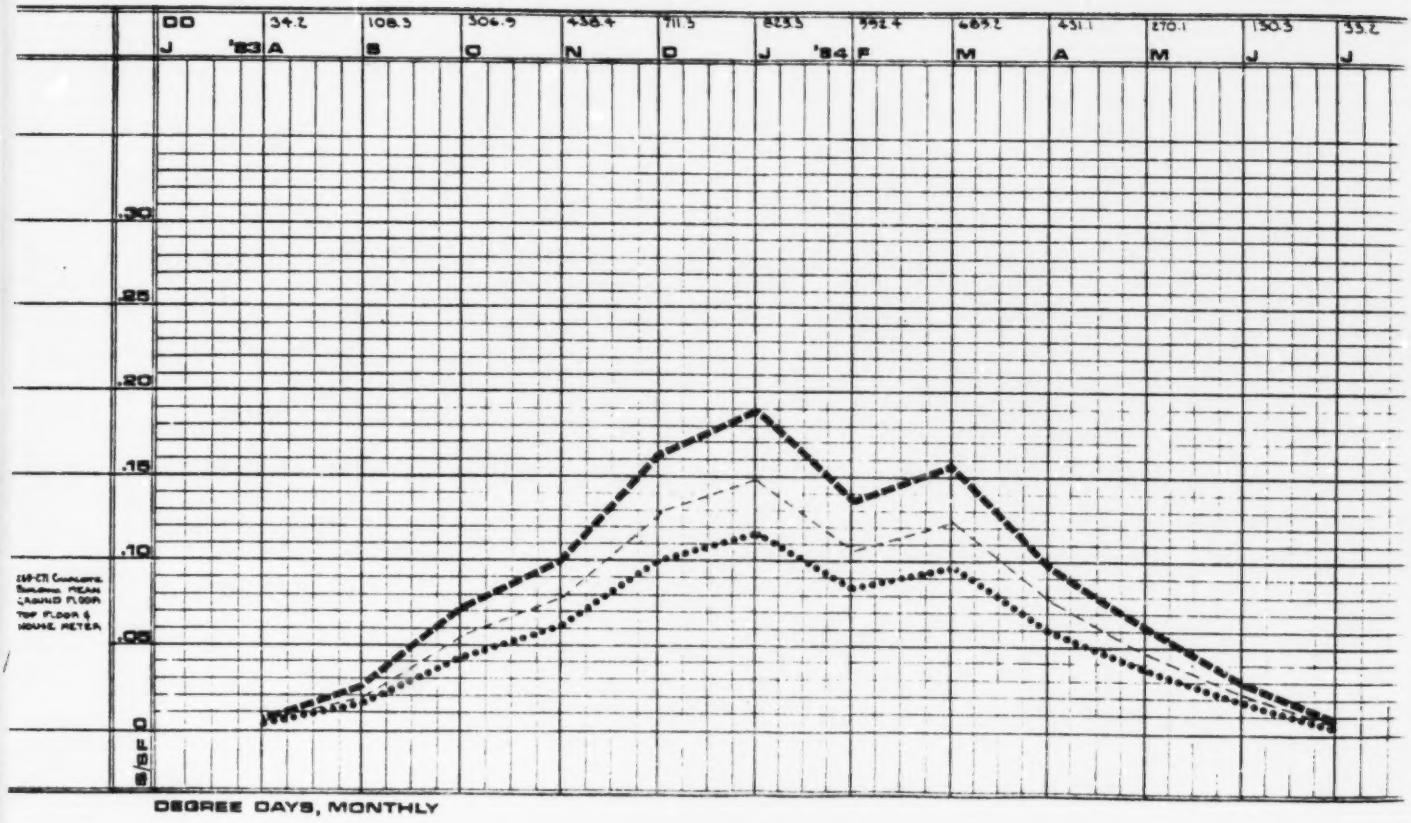
101 VICTORIA STREET
WOOD FRAME, ELECTRIC HEAT



DEGREE DAYS, MONTHLY

ENERGY CONSUMPTION

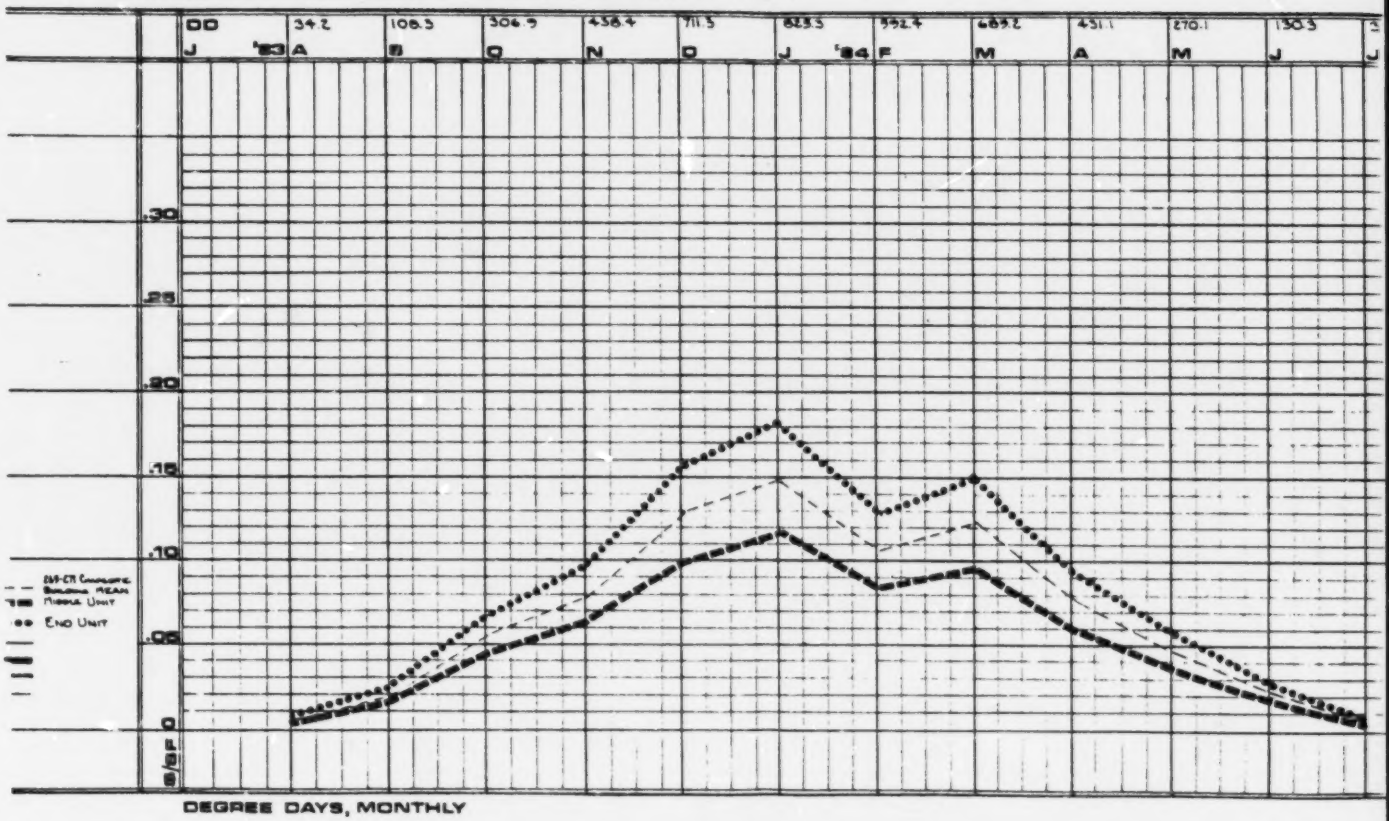
91 CITY LINE
WOOD FRAME, ELECTRIC HEAT



DEGREE DAYS, MONTHLY

ENERGY CONSUMPTION

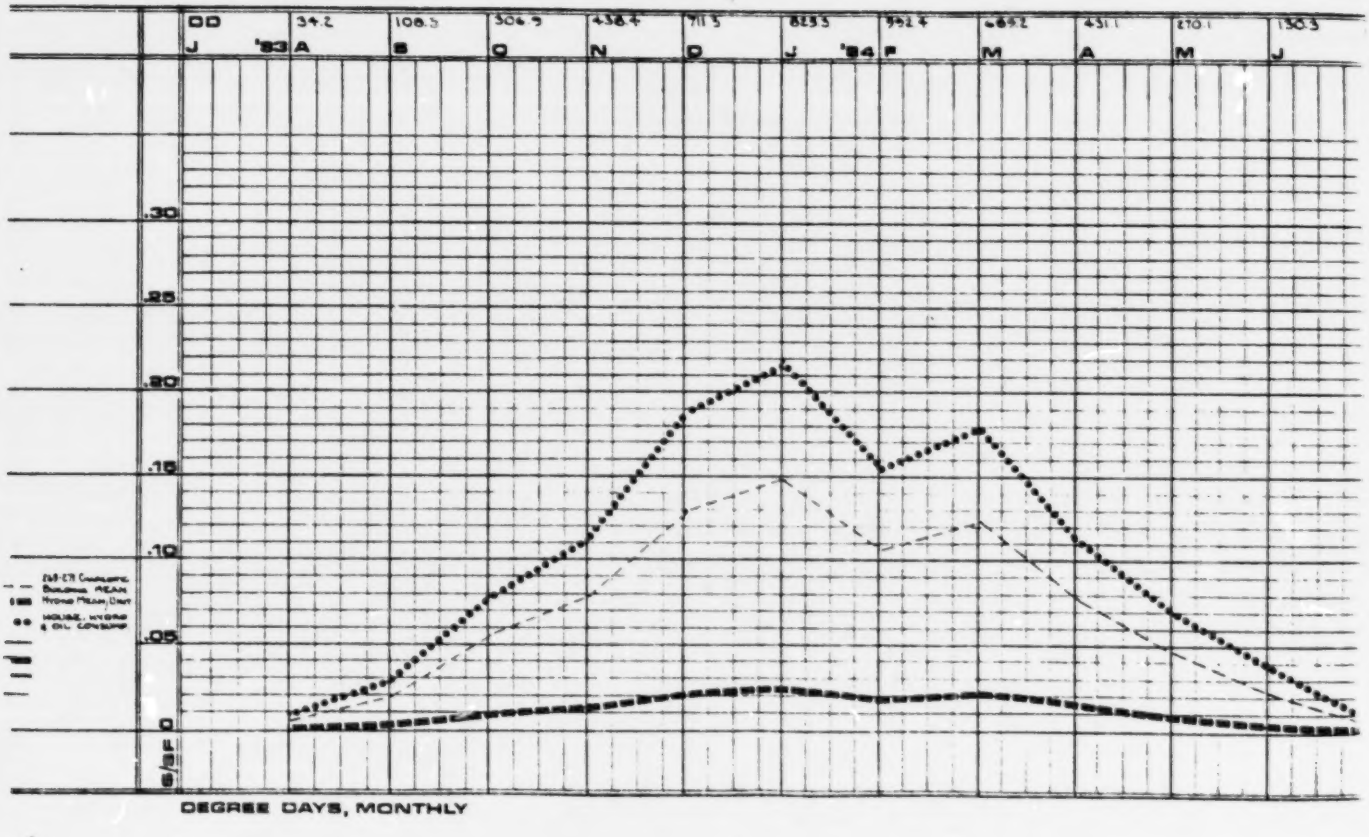
HIGH MEADOW FARM
Wood Frame Townhouse, Electric Heat



DEGREE DAYS, MONTHLY

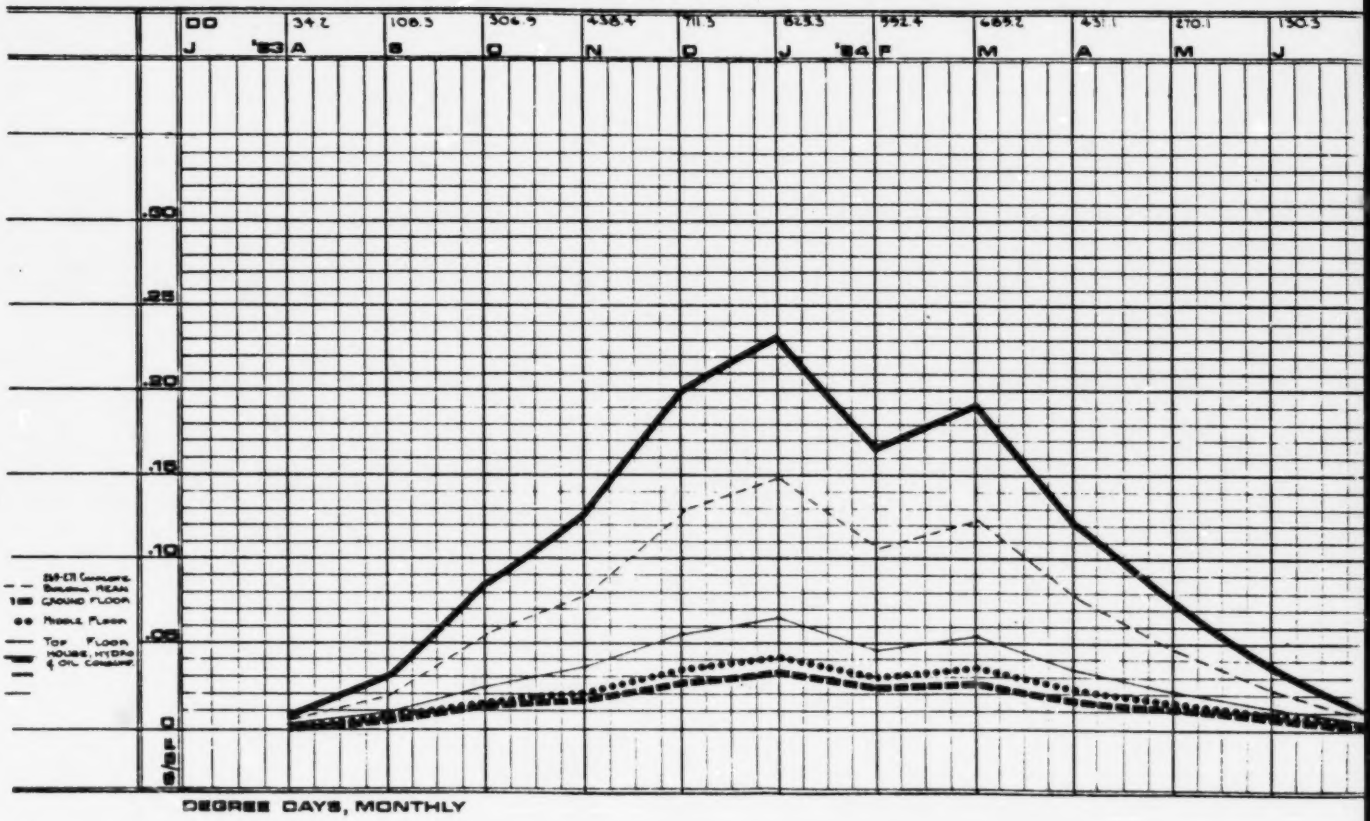
ENERGY CONSUMPTION

244 GERMAIN STREET
MASONRY, OIL FIRED HEATING



ENERGY CONSUMPTION

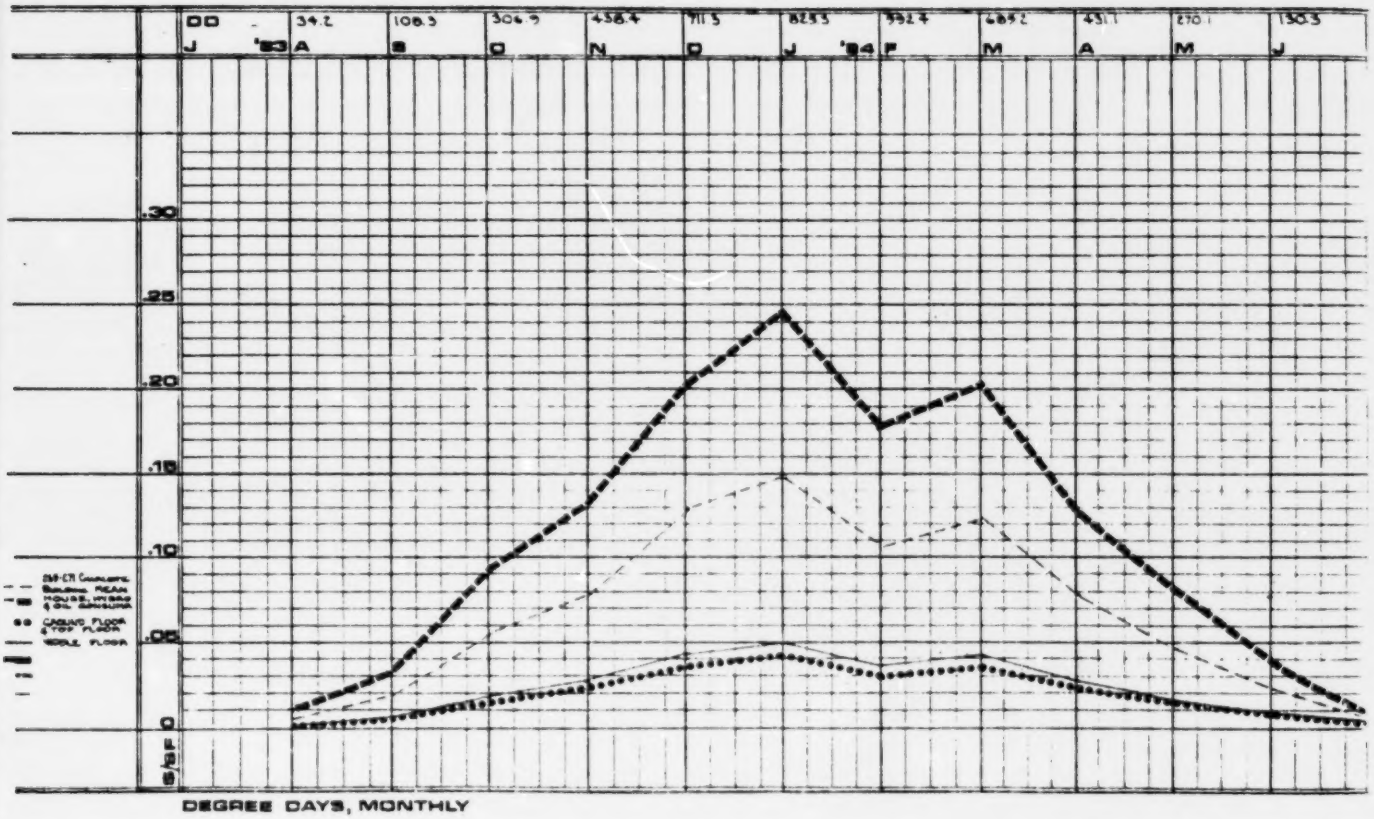
99 DOUGLAS AVE
WOOD FRAME, OIL-FIRED HEATING



DEGREE DAYS, MONTHLY

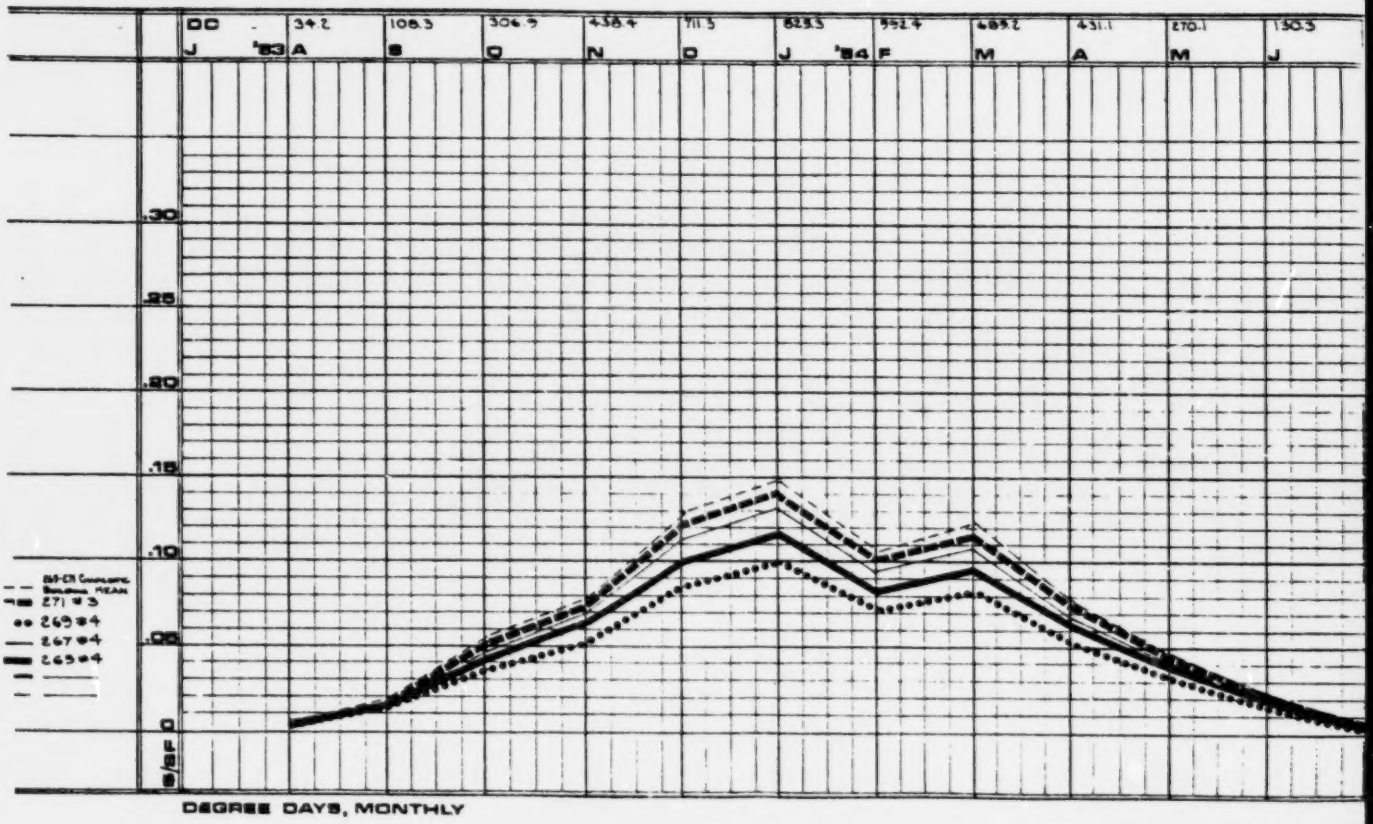
ENERGY CONSUMPTION

93 VICTORIA STREET
Wood Frame, Oil Fire Heating



DEGREE DAYS, MONTHLY

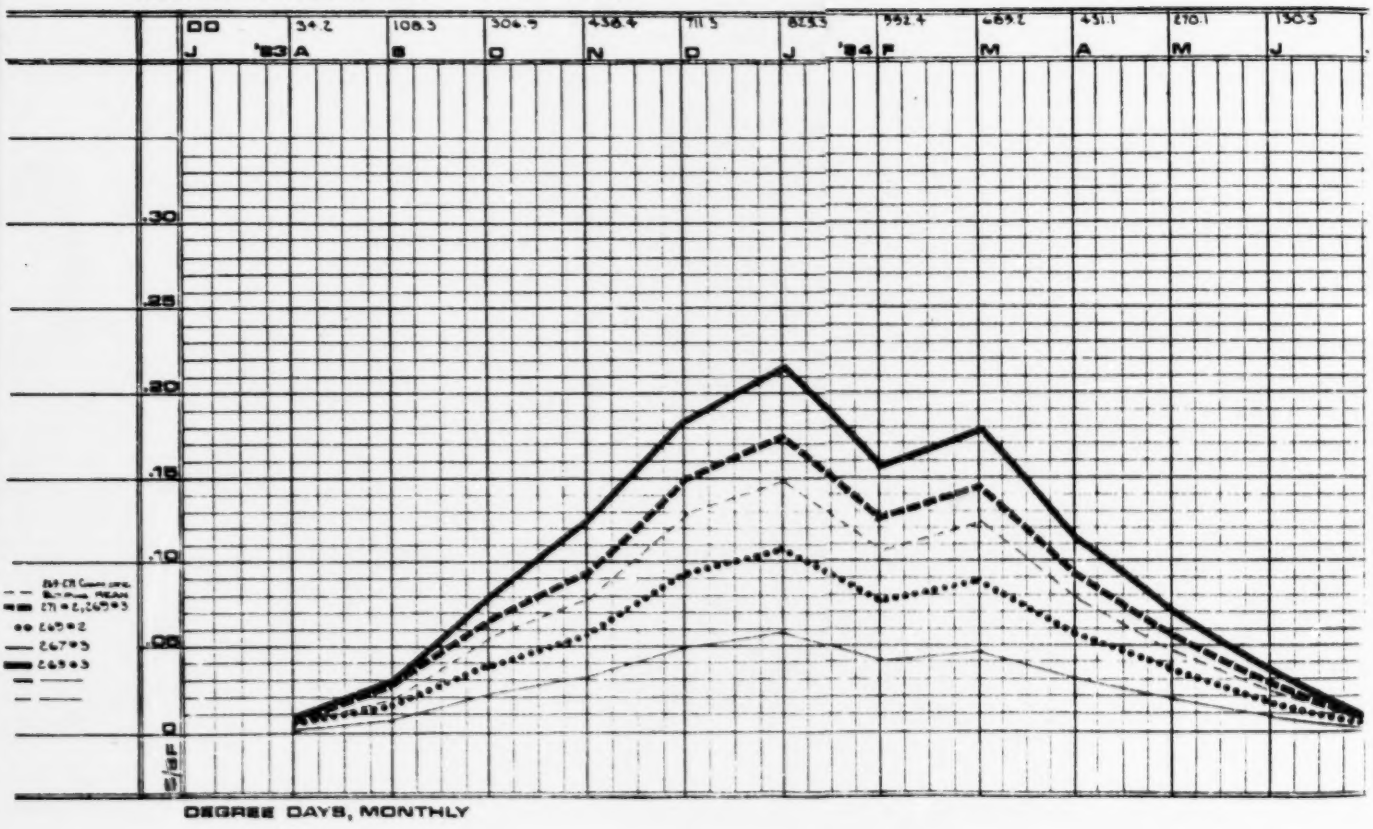
ENERGY CONSUMPTION 265 & 271 CHARLOTTE STREET TOP FLOOR



DEGREE DAYS, MONTHLY

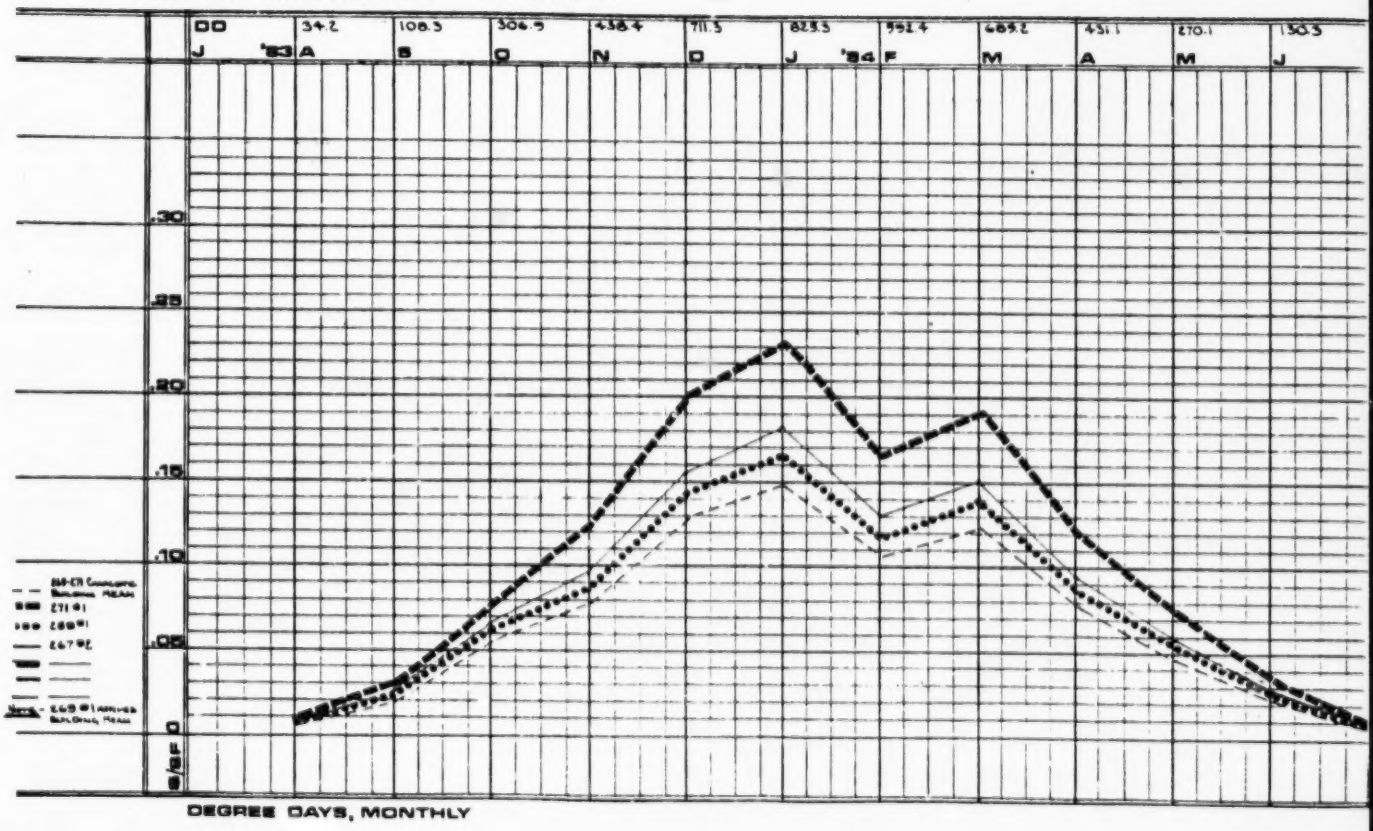
ENERGY CONSUMPTION

245-2 CHARLOTTE STREET
SECOND FLOOR



DEGREE DAYS, MONTHLY

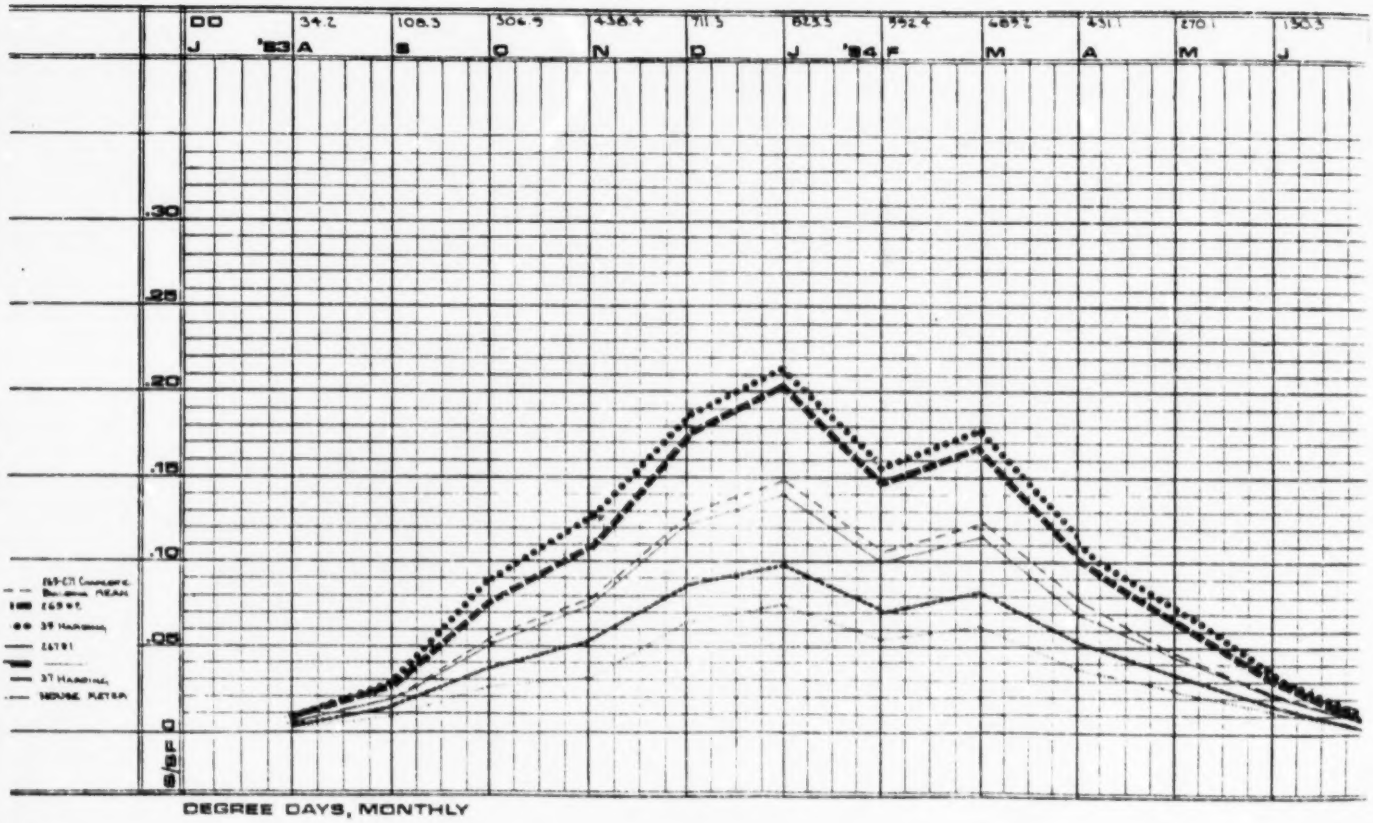
ENERGY CONSUMPTION 269-271 CHARLOTTE STREET MAIN FLOOR



DEGREE DAYS, MONTHLY

ENERGY CONSUMPTION

269 - 271 CHARLOTTE STREET
BASEMENT LEVEL

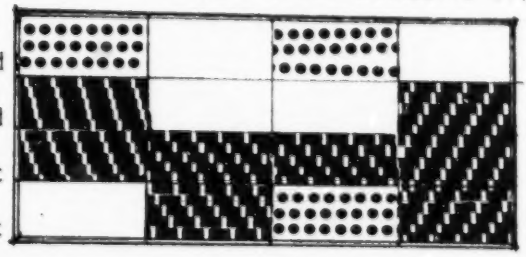


DEGREE DAYS, MONTHLY

RELATIVE ENERGY CONSUMPTION
265-271 CHARLOTTE STREET

LEGEND SYMBOL	UNIT NUMBER	ENERGY CONSUMPTION $/1000 ft^2	LOCATION IN BUILDING
■	35 Harding	0.29	Basement
■	Apt. 271 #1	0.28	First Floor
■	Apt. 265 #3	0.26	Second Floor
■	Apt. 265 #2	0.25	Basement & First Floor (2 levels)
■	Apt. 267 #2	0.22	First Floor
■	Apt. 269 #3	0.21	Second Floor
■	Apt. 271 #2	0.21	Second Floor
■	Apt. 269 #1	0.20	First Floor
■	Apt. 265 #1	0.18	First Floor
■		0.18	Building Mean
■	Apt. 271 #3	0.17	Third Floor
■	Apt. 267 #1	0.17	Basement
■	Apt. 267 #4	0.16	Third Floor
	Apt. 265 #4	0.14	Third Floor
	Apt. 269 #2	0.13	Second Floor
	Apt. 269 #4	0.12	Third Floor
	37 Harding	0.12	Basement
	Apt. 267 #3	0.07	Second Floor

VERTICAL SECTION, 265-271 CHARLOTTE ST.



LEGEND

Above Building Mean*

Near Building Mean*

Below Building Mean

*Units to receive additional capital work, i.e. air-sealing.

South City Housing Co-operative

265-271 Charlotte Street

Apt. 35 Harding Street

ENERGY CONSUMPTION

SAMPLE DATA SHEET

UNIT NO. 2 UNIT AREA 930 SF

DATE OF READING		Aug 19	Sept 20	Oct 21	Nov 18	Dec 20	Jan 23	Feb 17	Mar 20	Apr 18	May 17	June 19	July 20
CONSUMPTION	KWH	450	1050	1130	1890	3000	3890	2740	2900	2850	2050	1470	86(
	ℓ	.	.	.	.	.	.	.	.	.	.	.	.
DAYS SINCE LAST READING	Days	17	33	31	28	32	34	25	31	29	29	34	3(
CONSUMPTION/DAY	KWH/D	26	32	36	68	94	114	110	93	98	71	43	29
	ℓ/D	.	.	.	.	.	.	.	.	.	.	.	.
CONSUMPTION/DAY/SF	KWH/D/SF	028	034	039	073	101	122	0118	0.10	105	076	046	03
	ℓ/D/SF	.	.	.	.	.	.	.	.	.	.	.	.
COST/DAY/SF*	$/D/SF	001	002	002	004	005	006	006	005	005	004	002	00(
	$/D/SF	.	.					.	.	.	.	.	.
TOTAL COST/DAY/SF*	$/D/SF	001	002	002	004	005	006	006	005	005	004	002	002

AVERAGE COSTS/DAY/SF*	$/D/SF	0.0037
DAYS ELAPSED	Days	358
CORRESPONDING DEGREE DAYS ELAPSED	DD	4539
COSTS/DD/SF*	$/DD/SF	00029

*Based on one ... oil $ 0.09
and ... kWh $ 0.05 January, 1985

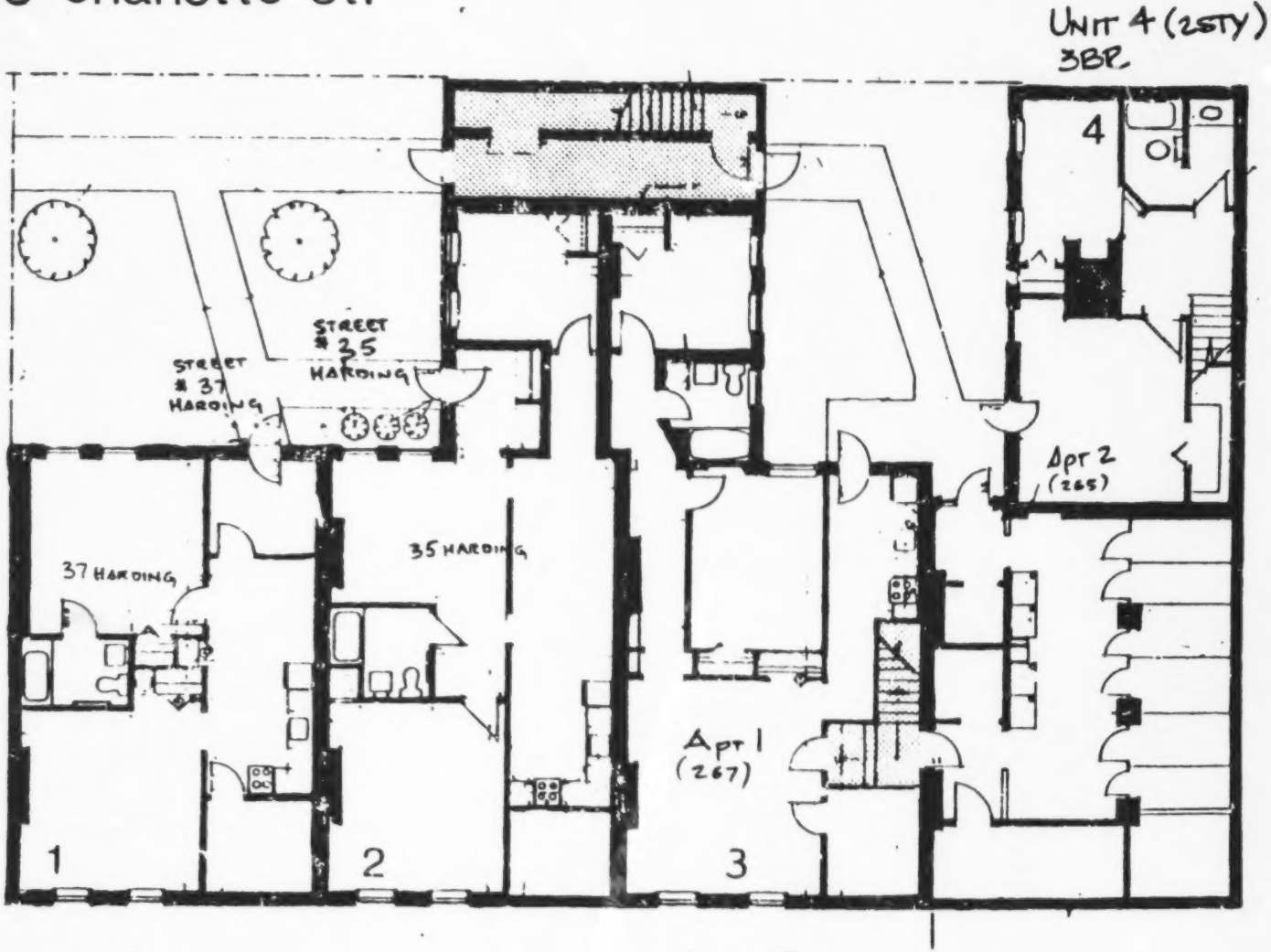
8.3 BUILDING DESCRIPTIONS

BUILDING	UNIT BREAKDOWN	TOTAL AREA	AGE	BUILDING TYPE	EXPOSURE	CONFIG-URATION	RETROFIT	ENERGY CONSUMPTION $/DD/1000 SF
93 Victoria St.	3 units - 3 bed	3700 SF	1910	- 3 story, wood frame. - oil-fired hot water baseboard heat. - wood foundation with crawl space.	semi-sheltered.		none	$.35
99 Douglas Ave.	3 units - 1-1 bed 2-4 bed	5000 SF (excl. basement)	1890	- 3 story, wood frame - oil-fired hot water, baseboard heat. - conc. foundation with full basement.	semi-sheltered.		limited	$.33
244 Germain St.	4 units - 2-1 bed 2-2 bed	4270	1890	- 3 story, masonry. - oil-fired hot water radiant heat, some electric baseboard. - unit in basement.	-3 floors semi-sheltered; -top floor exposed.		limited; -new storm windows.	$.29
High Meadow Park	3 bedroom townhouse	910	1970	- 2 story, wood frame. - electric baseboard heat & DHW. - on conc. slabs.	-2 walls exposed; -end units 3 walls exposed.		-insulated; -new storm windows; -air sealed.	$.18
265-271 Charlotte St.	17 unit - 7-1 bed 8-2 bed 2-3 bed	18000	1880	- 3 story, masonry. - electric baseboard heat & DHW. - basement units on conc. slabs.	-exposed on all sides; -corner lot.		-new windows; -insulated walls R-23 roof R-23; -insulated conc. slabs; -existing chimneys sealed; -new doors; 20 gal. DHWM.	$.18
91 City Line	2 unit - 2-3 bed	2500 (excl. basement)	1900	- 2 story, wood frame electric baseboard heat & DHW. - conc. foundation with full basement.	-4 walls exposed.		-insulated walls and ceiling; -new storm windows.	$.17
101 Victoria St.	4 unit - 1-4 bed 1-3 bed 1-2 bed 1-1 bed	4350	1910	- 3 story, wood frame. - electric baseboard heat & DHW. - conc.& wood foundation with crawl space.	-4 walls exposed; -corner lot		-40% new windows - new storm windows; -existing chimneys sealed. -insulated walls R-12 ceiling R-34; floor R-12.	$.15

South City Housing co-op

MMC MOTT, MYLES & CHATWIN LTD. ARCHITECTS

265 charlotte st.



UNIT 1
1BR - HC

UNIT 2
2BR - HC

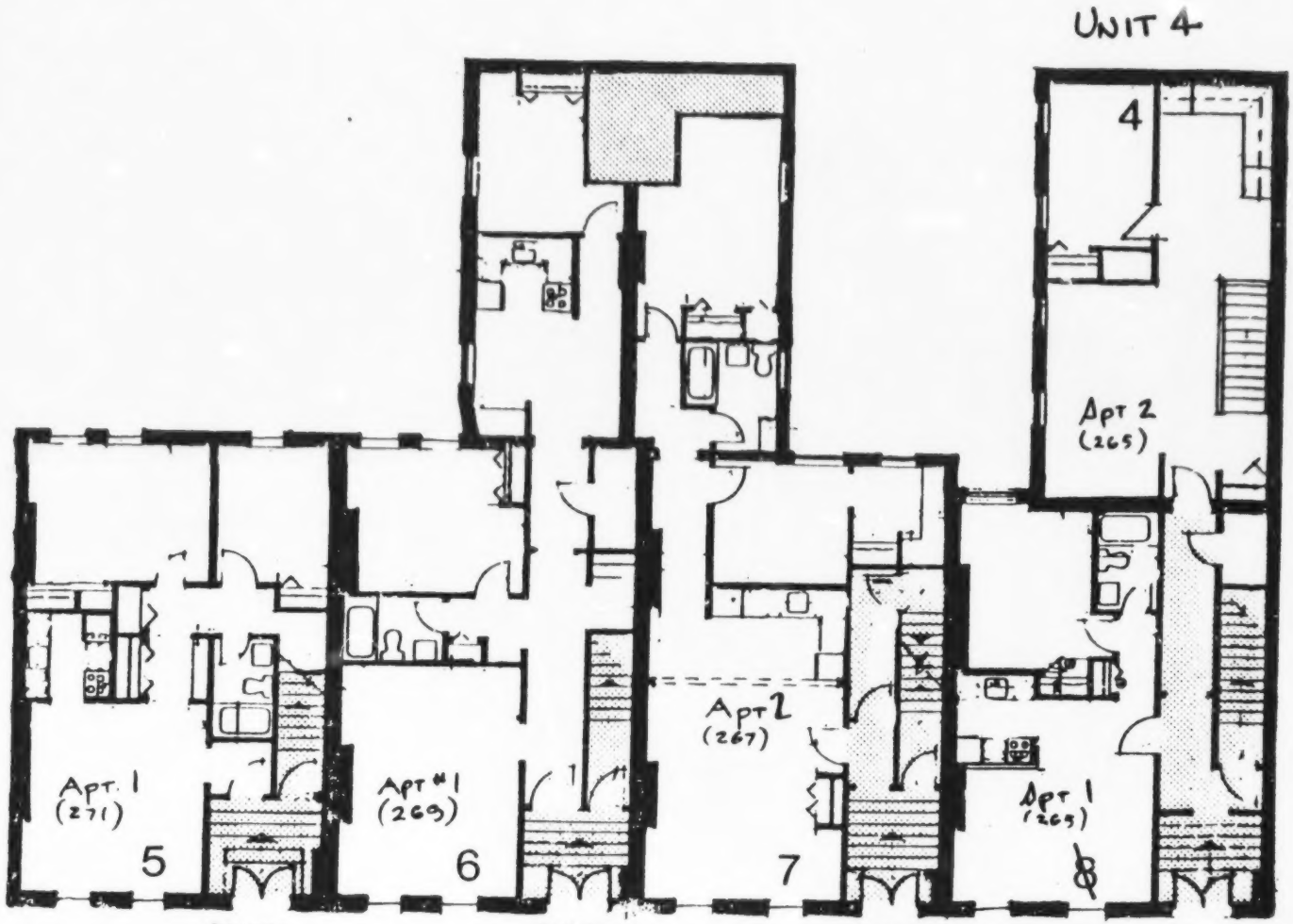
UNIT 3
2BR

8.4 Demonstration Project Plans

South City Housing Co-op

MMC MOTT, MYLES & CHATWIN LTD. ARCHITECTS

265 charlotte st.



UNIT 5 2BR — STREET # 271 5 UNITS

UNIT 6 2BR — STREET # 269 4 UNITS

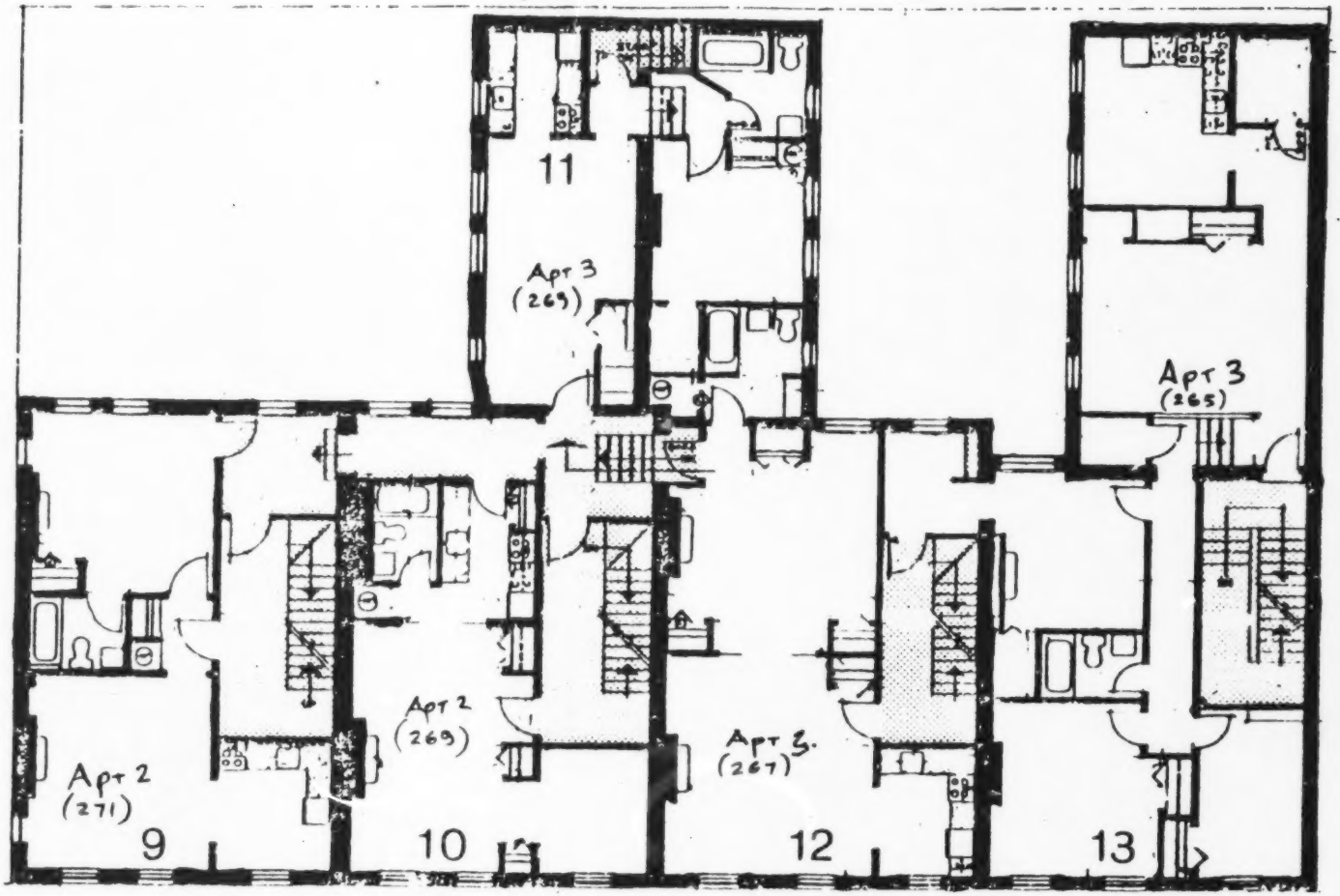
UNIT 7 2BR — STREET # 267 4 UNITS

UNIT 8 1BR — STREET # 265 4 UNITS

south city housing co-op

MMC MOTT, MYLES & CHATWIN LTD. ARCHITECTS

265 charlotte st.



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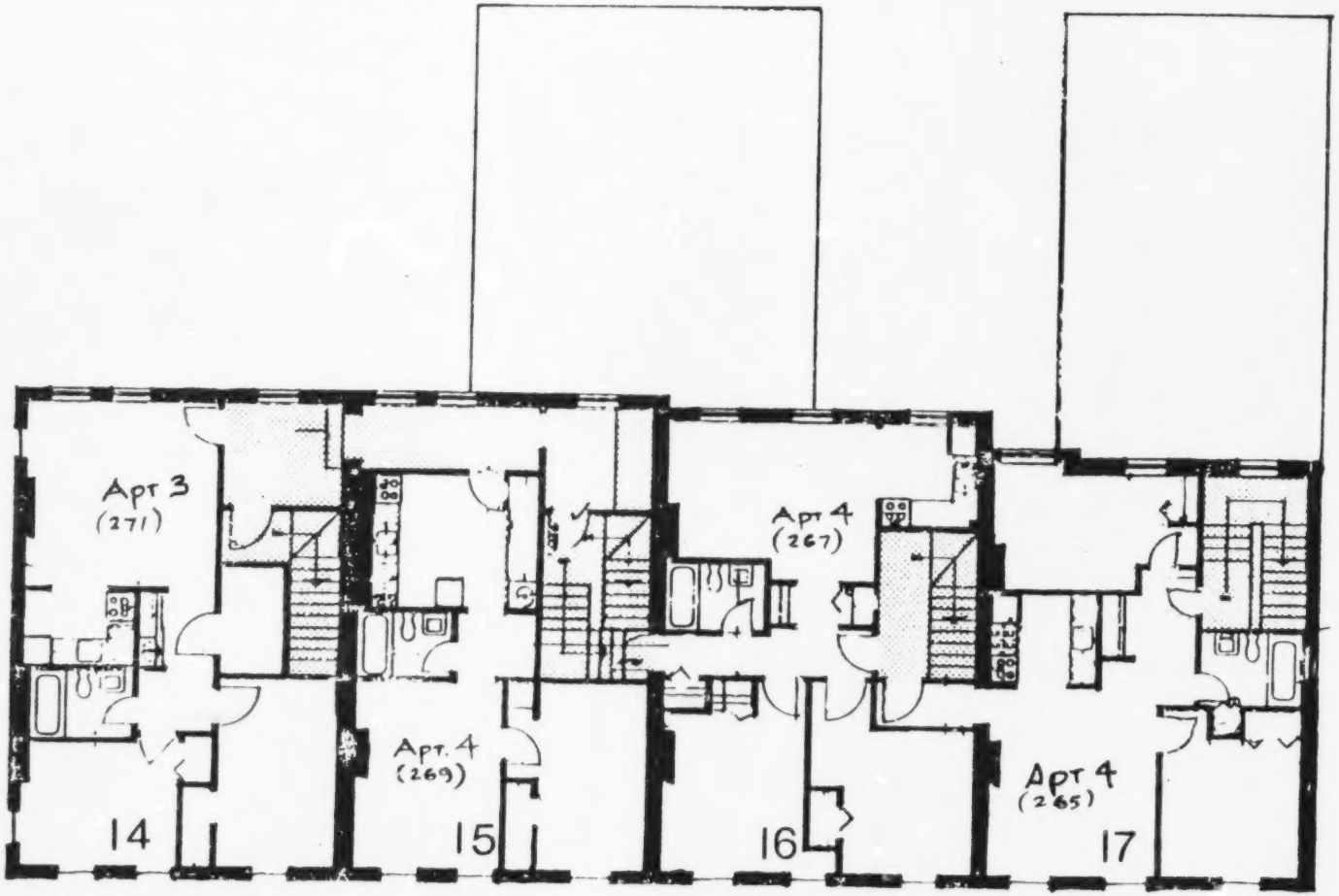
south city housing co-op

MMC MOTT, MYLES & CHATWIN LTD. ARCHITECTS

265 charlotte st.



8.5 PHOTOGRAPHS

265-271 CHARLOTTE STREET

Co-Op Housing Retrofit

South City Housing Co-operative

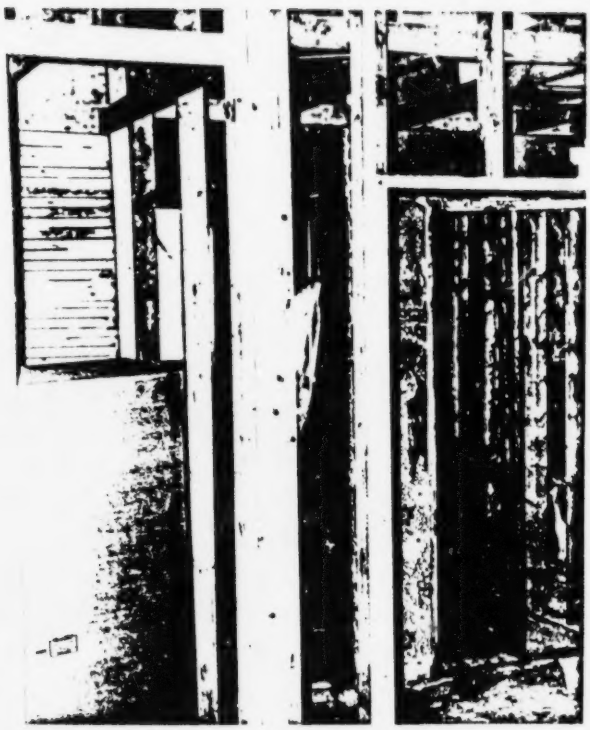
Canada/New Brunswick Conservation and Renewable Energy Demonstration Program

New Interior Stud Wall and Existing Plaster and Lath

New Insulated Stud Wall & Window Opening

New Window in Existing Opening

New Window, Finished



Rough Framing @ Interior Partitions

New Window in Existing Opening, With Reused Trim

New Interior Stud Wall @ Existing Fireplace